Chapter 13

Autopsy

"Estimating the time of death is one of the most difficult and inaccurate techniques in forensic pathology."

– Milton Helpern[1]

1. Meaning of Autopsy

Autopsy is a surgical procedure that consists of a thorough examination of a corpse by dissection to determine the cause, mode, and manner of death (called forensic autopsy or medico-legal autopsy) or to evaluate any disease or injury that may be present for research or educational purposes (clinical or academic autopsy). For the purpose of this book forensic jurisprudence, we are concerned only with forensic autopsy in this chapter. Autopsy is also called necropsy.

The term *autopsy* comes from Greek word *autopsia*, meaning "to see with one's own eyes."[2]

The word autopsy has been used since around the 17th century, it refers to the examination of inside the dead human body to discover diseases and cause of death.[3] Autopsy is used interchangeably with the term post-mortem. The term "post-mortem" is derived from Latin term *post* meaning "after" and *mortem* meaning "death". It was first recorded from 1850. Latin phrase *ante mortem* meaning "before death" is attested in English by 1823.[4] Autopsy is often called 'post mortem examination'.

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[1] In his book "Autopsy - The Memoirs of Milton Helpern, the World's greatest medical detective", published by St. Martin's Press, New York, 1977, on page 116.

[2] Rothenberg, Kelly (2008). "The Autopsy Through History". In Ayn Embar-seddon, Allan D. Pass (ed.). *Forensic Science.* Salem Press. p. 100. ISBN - 978-1-58765-423-7

All deaths of unnatural (homicide, suicide, accident) manner, suspicious deaths, and unexpected deaths require a legal investigation, of which autopsy is a part. Autopsy is followed by instructions from the concerned legal authority responsible for the medico-legal investigation of sudden, unexpected, suspicious, mysterious, unwitnessed, obscure, unexplained, or litigious deaths, criminal deaths, industrial deaths, and deaths associated with medical or surgical treatment where medical negligence is alleged or anesthetic deaths.[5] Autopsy investigates deaths demanding further explanation.

2. Purpose of Autopsy

Broadly, the sole objective of medico legal autopsy is to discover substantive and scientific evidence that exists within the corpse so as to help the court in the process of administration of justice. In observing and discovering such evidences, the examiner applies his technical medical knowledge.

The purpose of forensic autopsy differs from one case to another and may be specific for a particular case. Nevertheless, in general, there are four major objectives of conducting a forensic autopsy:

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[3] Clark MJ (2005). "Historical Keyword "autopsy."" The Lancet. 366 (9499): 1767.

[4] https://www.etymonline.com/search?q=post-mortem %7Cwebsite=

[5] Ritesh G. Menezes; Francis N. Monteiro; Forensic Autopsy, StatPearls Publishing LLC. (2020) (https://www.ncbi.nlm.nih.gov/books/NBK539901/ Retrived: September 13, 2020)

a) To establish identity of the dead: Establishing identity of deceased is of paramount importance while conducting a forensic autopsy on an unknown body. At times, confirming the identity of the deceased also matters.

b) To determine cause of death: Major cause of unnatural death occurs due to asphyxia. Hanging, drowning, poisoning, severe blood hemorrhage, strangulation, injury, electrocution, blunt force injury on head, sharp force injury etc. are frequent causes or manners of death. Details about these causes are discussed in Chapter 14 regarding Asphyxia.

c) To determine manner of death: It may assist in confirming or refuting the alleged manner of death. The way how death is caused is called manner of death, and it could be either natural or unnatural. For instance, if a head injury is the cause of death broadly, then how the head injury occurred can be accidental or suicidal or homicidal. Death from a head injury can result from an accidental fall from a height, or a suicidal jump from the top of a building, or a deliberate push from the roof terrace, in which case the manner of death is considered homicidal. To be more precise, let us consider subarachnoid hemorrhage as the cause of death. Subarachnoid hemorrhage can result from a spontaneous rupture of a berry aneurysm (natural mannered death) or can be secondary to blunt force impact to the head (unnatural mannered death).

d) To estimate time of death: It is helpful to find time since death or postmortem interval.

Other causes could be:

(e) To identify weapon used in murder,

(f) To identify poison or nature of poison used in murder,

CS CamScanner

(g) To identify whether any disease has contributed into death, and

(h) To identify whether other additional crimes are also associated with murder such as rape and murder.

The purpose of a fetal autopsy or an autopsy of a neonate has three specific medico-legal objectives: First, to determine the intra-uterine/gestational age of the fetus, ultimately aiming to know whether the fetus was viable or not (to assess the viability of the fetus). Second, if viable, to determine whether it was born alive (live birth) or dead (dead birth/stillbirth). Third, if born alive, to determine the period of survival after birth, the cause, and manner of death.

In case of a body taken out of water, one of the specific medico-legal objectives of conducting autopsy is to find out whether the cause of death was drowning or whether the person died by some other means and then the body was disposed in the water to conceal the crime.

Similar concern is in cases of simulated hanging where perpetrators of a homicide present it as a suicide.

In a building conflagration case, specific medico-legal objectives of conducting autopsy are to determine whether the person died of burns or otherwise (for example fall of masonry while in a building on fire or inhalation of irrespirable gases) and to differentiate ante-mortem burns from postmortem burns. Autopsy finding of the presence of soot particles in the distal airways and autopsy ancillary investigation finding of the presence of carboxyhemoglobin (COHb) in blood do not necessarily prove that the body surface burns are antemortem in nature, but that the victim was alive when the fire was in progress,[6] which is not the same conclusion.

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[6] Hirsch CS, Adelson L. Absence of carboxyhemoglobin in flash fire victims. JAMA. 1969 Dec 22;210(12):2279-80

A dead body recovered from a fire may present with cutaneous burns sustained before death or after death or at both times. Continued application of fire to skin after death vs. skin burnt before death usually puzzle the antemortem features of burns and poses a challenge to the forensic pathologist in determining the nature of burns. Such a situation may arise even in air-crash incidents where there is a fire.[7]

Professor Stephen Cordner rightly points- it isn't always straightforward to opine the cause of death in forensic practice. In his words, "Substantial delay between injury and death, non-fatal injury precipitating death in a relatively short time from natural causes, a peculiarity of the victim rendering a survivable injury fatal" are realities often encountered in forensic autopsies.[8]

Autopsy surgeons also commonly encounter cases where the pathological evidence of injury or disease are obliterated by advanced postmortem changes and occasionally cases where the opinion regarding the cause of death is entirely dependent on the interpretation of circumstantial evidence.[9] Moreover, they often see cases with multiple competing potential causes of death in autopsy practice.[10]

While division bench in *Maniram Kurmi* case[11] denied entertaining autopsy conducted in foreign land as evidence in Nepalese court, full bench in same case[12] interpreted that-autopsy conducted in Gorakhpur hospital of India may be taken as evidence in Nepalese courts.

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[7] Ritesh G. Menezes; Francis N. Monteiro; Forensic Autopsy, StatPearls Publishing LLC. (2020) {https://www.ncbi.nlm.nih.gov/books/NBK539901/ Retrived: September 13, 2020}

[8] Cordner SM. Deciding the cause of death after necropsy. Lancet. 1993 Jun 05;341(8858):1458-60.

[9] Cordner SM. Deciding the cause of death after necropsy. Lancet. 1993 Jun 05;341(8858):1458-60.

[10] Supranote 8 at 113-21.

[11] *Maniram Kurmi* v. *Gaffur Musalman et.al.*, NKP 2021, V 2, P 23.

[12] *Ibid*

As held in *Binaya Manandhar* case,[13] "dead body itself and its examination by expert are helpful for court in deciding cause of death. In this sense, such expert opinion may be considered as one of the strong medical evidences."

Autopsy is important even in identifying guilt in wild life offences. In *Dal Bahadur Praja* case,[14] a male rhino of 20 years was found dead in Chitwan National Park. Autopsy conducted by senior veterinary doctor that opined cause of death as gunshot followed by cutting of horn for illegal trade was considered as an expert opinion on the basis of which, guilt was established by court.

3. Qualities of Autopsy Expert

Autopsy might have been conducted by a forensically trained medical doctor or autopsy surgeon or by a forensic pathologist. The significance of the powers of observation and interpretation of autopsy findings, awareness of different possibilities, and a flexible and open mind, of the autopsy surgeon, is always stressed.[15]

Failure to maintain high standard of care of postmortem examination due to a low level of competency in forensic pathology can lead to mistakes in opinions concluded by the autopsy surgeon causing errors and ultimately injustice.[16]

The literature reports forensic autopsy cases with erroneous opinions related to the cause of death, and therefore emphasizes requirement of adequate training of autopsy surgeon.[17]

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[13] *Binaya Manandhar* v. *GoN*; Homicide, NKP 2067, V 2, FB, DN 8311.

[14] *GoN* v. *Dal Bahadur Praja* et.al; Rhino killing and horn trade, NKP 2075 V 2. DN 9949.

[15] Simpson K. The Investigation of Obscure Deaths. Can Med Assoc J. 1964 Oct 17;91:845-50.

[16] Ibid

[17] Banwari M. An erroneous opinion on a cause of death in a forensic autopsy: a case report. Afr Health Sci. 2017 Dec;17(4):1246-1249.

A doctor should not hesitate to enquire any person or collect relevant information in order to find out relevant medical facts.[18] Doctors should always be encouraged to observe and see the crime scene.[19] Though it is true that the role of forensic experts is not same like police authorities who carry criminal investigation yet, it becomes duty of all citizens to support in finding truth behind homicide. Doctor who conducts autopsy is familiar with the scenario and environment of death, condition and situation of dead body and this first hand information of doctor is helpful in criminal investigation.

4. What should be cared in autopsy?

In addition to a complete and meticulous dissection of the dead body, care should also be taken to: (a) obtain photographs and video films for future evidential use in the court of law. (b) Retain samples (body viscera and fluids) for chemical/toxicological analysis, histopathological/microscopic examination, and/or other ancillary investigations, (c) Restore autopsied body to the best possible cosmetic condition before handing over to the concerned legal authority, (d) Provide a detailed written postmortem examination report of the autopsy findings, and their inferences concluded based on scientific reasoning.[20]

Other ancillary investigations (not an inclusive list) include the examination of: Blood for grouping; viscera and blood for microbiological culture; body fluids for postmortem chemistry

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[18] Simpson, Keith (1982) Forensic Medicine, 8th Edn., Reprint 1982, ELBS and Edward Arnold (publishers) Ltd., London, P. 231

[19] Nandy Apurba, (1996) Principles of Forensic Medicine, Reprinted 1996, New Central Book Agency (P) Ltd., Calcutta, India, P. 189

[20] Ritesh G. Menezes; Francis N. Monteiro; Forensic Autopsy, StatPearls Publishing LLC.(2020){https://www.ncbi.nlm.nih.gov/books/NBK539901/Retrived: September 13, 2020}

(Thanatochemistry);[21] vaginal swabs, anal swabs, swabs from bite marks, etc; stains on the skin or fabric/clothing; and material for DNA typing.

Artifacts: The autopsy surgeon should be aware of artifacts (resuscitation artifacts, agonal artifacts, and postmortem artifacts) that may be present during an autopsy. A postmortem artifact is regarded as any change produced in the body or any feature introduced into the body, after death, that often leads to much confusion about its nature and causation, and often results in misinterpretation of medicolegally significant antemortem findings or is itself wrongly considered as a significant antemortem finding.[22] The changes that occur during the agonal period and the injuries introduced during resuscitative measures may also pose interpretative difficulties to the autopsy surgeon.[23]

5. Types of Autopsy

Autopsy is called 'Negative Autopsy' if no positive finding could be found regarding cause of death despite gross, microscopic, toxicological, and other necessary ancillary investigations. In about 2-5% of all postmortem examination cases, the cause of death remains unknown, even after all laboratory examinations including microscopic and toxicological examination.[24] Reasons of negative autopsy include: (a) Inadequate history. (b) Inadequate external examination and internal examination. (c) Insufficient laboratory examinations. (d) Lack of toxicological analysis. (e) Lack of training of the doctor.

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[21] Thanatochemistry is chemistry of death. For example, evaluation of the potassium levels in the vitreous humor is useful in estimating the time since death during an autopsy in the early postmortem period.

[22] Kanchan T, Menezes RG, Manipady S. Haemorrhoids leading to post-mortem bleeding artefact. J Clin Forensic Med. 2006 Jul;13(5):277-9.

[23] Edston E. Evaluation of agonal artifacts in the myocardium using a combination of histological stains and immunohistochemistry. Am J Forensic Med Pathol. 1997 Jun;18(2):163-7. [Also: Ram P, Menezes RG, Sirinvaravong N, Luis SA, Hussain SA, Madadin M, Lasrado S, Eiger G. Breaking your heart-A review on CPR-related injuries. Am J Emerg Med. 2018 May;36(5):838-842.]

Autopsy is called 'Obscure Autopsy' if it fails to serve the purpose of ascertaining the cause of death, despite the presence of trivial/unclear/obscure findings. An ill-informed opinion often turns out to be worse than no opinion at all. In the absence of an opinion, the legal authority investigating the death will be at least aware of the lacunae in his/her evidence/investigation, rather than deceived by the speculative or orchestrated statements made by the autopsy surgeon/forensic pathologist.

In general, a negative or obscure autopsy is one where the cause of death remains unascertained despite a complete, meticulous autopsy including ancillary laboratory tests. Such autopsies where the cause of death remains undermined despite a meticulous work-up of the cases are not uncommon in forensic practice.[25] With advanced laboratory investigation techniques, the cause of death in otherwise obscure autopsies is determined.[26] Nevertheless, forensic autopsies may conclude as either negative or obscure even in recent times. Where all organs of deceased are healthy and normal, and no any fatal injuries are seen in the body during autopsy, the examining doctor must not hesitate to opine- 'cause of death could not be ascertained' in autopsy report.

An autopsy is called ' second autopsy' if it is the one that follows the first autopsy on the same body. Some circumstances for a second autopsy include a repatriated body and exhumation of a previously autopsied body.[27] Second autopsy is usual in society where there is tradition of corpse burial as funeral culture, unlike cremation adopted widely in Nepal.

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[24] Gautam Biswas, Review of Forensic Medicine and Toxicology, (Edn 2, 2012) 125 Jaypee Brothers Medical Publishers (Retrieved on 19-10-2020: http://bvhmch.in/wp-content/uploads/2018/03/FMT-GOUTAM-BISWAS.pdf)

[25] Knight B. The obscure autopsy. Forensic Sci. Int. 1980 Nov-Dec;16(3):237-40.

[26] Lowe JW. The obscure autopsy and neuroleptic malignant syndrome. Med Sci Law. 1997 Jan;37(1):79-81.

6. Death and Autopsy

General understanding of death refers cessation of life from human being. This general understanding does not confer precise implementation of law. Death of a person is important in law because criminal liability and other constitutional, civil and legal rights and duties of person cease to exist after the person's death. Accordingly, legal issues such as cremation, transfer of heirship, inheritance etc. come to surface after death of a person. Medical science classifies death of person in different categories because different organs of the body die at different point of time. Advancement in successful practice of human organ transplantation has added new gamut in medical science. Human organ, which is not damaged and has not died naturally, could be transplanted to another needy human being. Therefore, extraction of living organs and tissue from dead person requires exact fixation of time of death of person for the purpose of organ transplantation. Application of artificial devices to keep person alive is another important factor contributing to realize this realm of medical science as beneficiary to humankind.

Law requires more than cessation of three primary functions i.e. respiratory, sensation and pulsation, to declare a person as dead. Person may stop respiration for some moment voluntarily. Cessation of sensation of particular body organ may not lead the person to death, immediately. Irreversible cessation of these three systems of the living person in required. However, brain may die earlier than respiratory function. Thus, it is disputable question that when a person dies exactly- either brain death or after complete cessation of three primary functions of the body.

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[27] Williams EJ, Davison A. Autopsy findings in bodies repatriated to the UK. Med Sci Law. 2014 Jul;54(3):139-50.

Definitions of death provided in medical literatures are relevant discussing:

a) "Death is an irreversible cessation of life and is classified as somatic and molecular. A 'deceased person' means a person in whom permanent disappearance of all the evidence of life occurs, due to a brain-stem death or in cardio-pulmonary sense, at any time, after live birth has taken place."[28] Modi has focused on permanent cessation of life meaning that a person shall not be considered as dead until there is fair possibility of reverse of life to a human body. The definition of Modi has clearly excluded death of stillbirth child. Further, he says that brainstem death or cessation of cardio-pulmonary sense leads permanent disappearance of life from a person. He took brainstem death as a step to lead permanent death of a person.

b) "Death is permanent and irreversible cessation of functions of the three interlinked vital systems of the body (the tripod of life), namely, the nervous, circulatory and respiratory system."[29] Nandy has provided this meaning of death as convenient to cover medico legal criteria of death. He proposed this view with a presumption that the microscopic classification of death of different organs of the body is useful to carry out necessary function required for organ transplantation and research of medical science. The permanent cessation of three primary functions of human body provides strong presumption that the person will never awake again. His approach might undermine the role to be played by brainstem death in further process of death. However, he did not forget that brainstem death and categorization of death of different organs and tissue is important in medical science. This purposefully serves the humankind by prolonging life of other person through transplantation of fresh, healthy organ of dying person to needy person.

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[28] P. Jaising Modi, Modi's Medical Jurisprudence and Toxicology 207 (B V Subramanyam eds, 22nd ed. 1999).

[29] Apurba Nandy, Principles of Forensic Science 134 (2nd ed. 2003).

c) Dr. K.S. Narayan Reddy has attempted to provide precise medico social practice in understanding of death. He viewed that death is the complete and irreversible stoppage of the circulation, respiration and brain functions, but there is no legal definition of death. Historically, the concept of death was that of 'heart and respiration death', i.e. stoppage of spontaneous heart and breathing functions. Heart-lungs bypass machines, mechanical respirators, and other devices, however have changed this medically in favour of new concept "brain death", that is irreversible loss of cerebral function.[30] Dr. Reddy has provided the glimpse of changing perception regarding death with advancement of medical science.

d) "A person is dead if the brain has stopped functioning. Brain death is ascertained by absence of functions of brainstem (Midbrain, Pons and Medulla)."[31] Sharma has simplified the meaning of death by providing criteria for death i.e. stoppage of brain functioning.

Observation of abovementioned definitions given by the eminent medico legal scholars has lead us to know that understanding of death of a person has been changed along with advancement in medical technologies and medical practices. Determination of death of a human being only through cessation of respiration, pulsation and sensation may not lead us in clear demarcation of existence of life and death. In this scenario, brainstem death has been getting valuable position in medical science. Therefore, it is convenient to understand death of a human being as brain death along with permanent cessation of three primary functions of the body i.e. respiration, pulsation and sensation. It is noteworthy that death occurs in living person after birth not in stillbirth case. There is no meaning of life in stillbirth because neither the brain nor other primary functions of stillbirth plays any role here.

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[30] Dr. K.S. Narayan Reddy, The Essentials of Forensic Science and Toxicology 112 (21st ed. 2002).

[31] Prof. R.K. Sharma, Fundamentals of Forensic Science and Toxicology (Medical Jurisprudence) 64.

Though it can be summarized that the process of death could be initiated through failure of three vital systems of body- (a) nervous system, (b) respiratory system, (c) circulatory system; the ultimate and modern definition for death lies on 'brain death'. Nepalese law [32] defines 'brain death' as: "*irreversible loss of the receptive and responsive activity of brain due to death of brainstem.*" The Act has defined brainstem as Midbrain, Pons and Medulla Oblongata connecting cerebrum and spinal cord at subsequent clarification.

[Human Brain Anatomy : *See figure 13.1 in figure section]*

7. Death Investigation

Definition and Types of Deaths

First amendment dated 25 Feb. 2016 (2072/11/13 B.S.) introduced Section 2(a1) into The Human Body Organ Transplantation (Regulations and Prohibition Act) 2055 B.S.

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[32] Human Body Organs Transplantation (Regulation and Prohibition) Act, 2055, sec 2(a1) (including first amendment on 2072/11/13).

that defines death as "irreversible loss of the receptive and responsive activity of brain due to death of brain stem". Nepalese law recognizes brain death as death.

Types of Death could broadly be categorized into (a) Somatic Death and (b) Molecular Death. The former is also called systemic death. This means death of overall body along with its three primary functions - Respiratory, Pulsation, and Sensation. The later involves death of individual cell of body also called cellular death or molecular death. Besides these, on the basis of manner of death, death could also be classified as- (i) Natural Death, and (ii) Criminal/ Suspicious Death. Suspicious death could be due to (a) Asphyxia (deprivation of oxygen by numerous reasons including drowning, hanging, strangulation, choking, gagging, smothering), (b) Poisoning, (c) Severe blood haemorrhage (due to shock), (d) Wounds/injuries, (e) Electrocution, (f) Lightening, and (g) Thermal injuries.

Death Investigation

Investigation of death in Nepal involves strict statutory procedures including preparation of three kinds of inquests (muchulka). First, Scene of crime inquest (Ghatnasthal muchulka). Second, dead body examination inquest (Lass janch prakriti muchulka). Third, seizure inquest (Khantalasi/ baramadi muchulka).

Scene of crime inquest is prepared in accordance to Muluki Criminal Code, 2074 B.S. , section 19 and section 8 (2), (3), and (4). The content of scene of crime inquest include - date and time of crime, location details and sketch of crime scene, situation and its nexus with offender, and offences committed. Section 8(3) stipulates procedure that requires scene of crime to be encircled for preventing unwanted entry. Evidences including palm print, fingerprint, footprints, shoe marks etc. should be photographed. Section 8 (4) requires investigator to collect fingerprint of person available at scene of crime. Section 19 (2) requires signature of two available persons and one Government Local member. Signature of person owning or possessing or controlling crime scene should also be affixed in inquest.

The Content of Scene of Crime Inquest include- identity contents/ details, place and situation of corpse, injury details, weapons details, other relevant signs or other clues to identify the death. In case of decayed or decomposed corpse, the same is to be mentioned in inquest by affixing signatures of local people. No procedure to hand over dead body to the relatives or family members for funeral can be carried without executing dead body inquest.

Seizure Inquest concerns with Section 18 of Muluki Criminal Procedure Code, 2074 B.S. Its purpose is to arrest any person or search any place for collecting evidences or documents. Investigator has duty to introduce oneself while initiating the procedure. Female body is to be searched through female police or any female. Two copies of inquest need to be executed, one for case file and next for record of house owner. Inquest is to be executed by police officer of at least sub investigator rank. The timing for search and seizure in general should be in between sunrise to sunset. Police can use force if obstructed in course of procedure. Suspicious objects can be taken into control by investigating officers.

Role of Police

As per Police Act,2012 B.S. the role of police is to maintain peace and order in the society through prevention of crime and investigation of crime. Investigation of crime involves procedures laid down by Muluki Criminal Procedure Code, 2074 B.S. Police receives First Information Report and then initiate investigation. Then measure should be taken by police to prevent evidences from being destroyed and offender from escape as per section 6 of the Act. Section 4 requires to collect evidences and arrest suspected person. Police needs to submit preliminary investigation report to concern District Attorney office within 3 days as per section 10. Support of needy experts can be taken by police in course of investigation under section 12. To detain suspect with permission of court, to interrogate detainee as per section 13 and 16, to conduct, search, seizure operation as per section 18 & 19, execute inquest as per Section 19 & 20, examine dead body in compliance with section 20, forward evidences for laboratory examinations as per Section 21, get wounds and injuries examined medically according to Section 22, maintain police diary as per Section 25, and finally submit final investigation report to Government Attorney as per Section 31 of the Act.

Principle and Procedures of Autopsy

Autopsy is a process of examination of dead body by medical doctor (specialized or trained in forensic medicine) for the purpose of identifying cause, time and manner of death. In conducting autopsy, the expert doctor needs to comply with certain principles at minimum: (a) Principle of Neutrality. Autopsy surgeon or expert must be free from any sort of biasness. (b) Principle of Clarity. Autopsy report should not be ambiguous and use of understanding language, and proper recording of specific and objective findings instead of opinions is to be done. (c) Principle of Confidentiality. Privacy of autopsy report is to be maintained unless required by law to disclose. (d) Principle of Formality. Procedures of law has to be strictly complied by autopsy surgeon including proper documentation of chain of custody. (e) Principle of Accountability. Doctor has to be prepared in case summoned for testimony by court. He should not neglect the liable imposed by law for issuing false autopsy report.

Procedure enumerated in Section 20 of the Muluki Criminal Procedure Code, 2074 B.S. is to be adhered by autopsy expert. Accordingly, receipt of autopsy request along with dead body from investigator by doctor (Authorization letter) is made at first. Government should bear expenditures for autopsy. Contents and procedure of autopsy report must be as specified by schedule 15. Following should be examined and recorded- Introductory matters, relevant details or historical details, external examination, internal examination, special examination, viscera collection when suspicion of poisoning, opinion on cause of death, conclusion on cause of death, conclusion on time of death, signatures or seal of hospitals.

Supreme Court in Diwash Dhakal case (NKP 2075 V 12, DN 10146) held- the major precondition and mandatory procedure for internal examination of neck is dissection of chest to reveal all organs and exposition of brain after dissection of head. The purpose of this sort of examination procedure is to ascertain whether injury caused to internal soft tissue of neck, neck bone or cartilage is antimortem or postmortem in nature.

Autopsy of adult versus Infant: Though the basic procedure of autopsy for adult deceased and infant deceased is similar, there are certain additional and minute observations needed in case of autopsy of infants. Autopsy in infants differ from autopsy in adults in numerous ways. First, the head is dissected in a flower like pattern using scissors as the head of infant is not permanently or strongly fused. In adults a machine is used to cut and drill hard and permanently fixed skull. Second, the major objective of autopsy in infant is to confirm whether the infant was born alive or dead. To confirm live birth or dead birth usually Hydrostatic Test is done. The lungs when kept in water bucket if float, indicates live birth. On the contrary if lungs sink, this indicates dead birth. Third, Milk Test is done in which presence of milk in stomach indicates live birth. Fourth, knee or bones examination help to estimate age.

8. Declaration & Certification of Death

Doctor or medical expert is expected to issue true, verified and genuine medico-legal reports, certificates and statements in their professional capacity. Taking gratuity, commissions, bonuses to issue fraudulent and misleading declarations or certifications, including negligent certification are gross professional misconducts that attract serious liability both under existing statute and Code of ethics for medical professionals.

Organ transplantation law of Nepal has also provisions relating to examination, declaration and certification of brain death.[33] It has mentioned the provisions relating to examination of brain death and declaration of death of patient. It directs a doctor to conduct preliminary health examination of the patient and determine whether his/her brainstem is permanently loosed along with presence of certain conditions on patient: (i) Irreversible loss; (ii) No reaction in stem of the mind; and (iii) There is absence of natural respiration on the body of patient.

When a preliminary test result affirms to death then the patient should be retested in order to ascertain brain death. If second health examination of the patient confirms brain death then doctor should declare the death of the patient. The time for death of the patient is to be deemed after doctor's declaration of death. Brain death related examination of the patient is required to be conducted by the group of qualified doctors comprising of doctors involved in treatment of the patient including at least one anesthesiologist or intensivist.

A medical doctor declares a person is dead after medical examination. The doctor could estimate the time since dead of deceased after physical examination. Medical doctors, board of medical doctor issues death certificate to a person after examination and finding no recovery of life is possible in the future. The medical examiner should take numbers of factor in consideration before declaring a patient is dead. Before certifying, he must satisfy himself that the respiratory, circulation and nervous systems have ceased permanently and irreversibly. Development of artificial machinery for prolonging respiratory system of the patient has directed the medical examiner to take other necessary inspection to assure himself that dying process of the patient is completed or rigor mortis has already begun. Accordingly, position and loss of receptive and responsive activity of brainstem should be taken into consideration. Further, beginning of cooling process and staining will provide strong basis for declaring a person dead.

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[33] Human Organs Transplantation (Regulation and Prohibition) Act, 2055,Chapter 3A

Nepalese law fails to clearly specify what exact liability should a forensic autopsy expert or a medical doctor conducting autopsy has to face in case of: (a) negligent autopsy report, (ii) reckless autopsy report, and (c) deliberately issuing false autopsy report taking unlawful financial benefit. Though existing NMC code of ethics broadly prohibits gratuity and commissions in 'doctor-patient relationship' in course of treatment, it is silent in case of 'autopsy examiner-dead body relationship. Issuing false report intentionally, negligently, and recklessly are yet to be criminalized. This legal vacuum can be addressed by amending chapter-4 (offences against public justice) in *Muluki* Criminal Code, 2074 B.S.

The current NMC Code of Ethics and Professional Conduct for Doctors, 2017 is too vague as it on one hand duty-bounds medical practitioners to issue only true and verified reports and certificates but on other hand simply says such actions are liable for disciplinary action. What exact disciplinary action is not clarified in its text rather this has been left to the discretion of council authorities.[34]

There is a need to enlist ethical violations & malpractices along with liabilities attached to each, clearly for a medical expert or doctor who commit such specified ethical violations in course of professional service delivery. The current NMC Code of Ethics and Professional Conduct for Doctors, 2017 is too vague[35] as it handovers blank cheque to the Ethical Committee to reward with soft action against complaint over members of professional fraternity by abusing discretion. This uncertainty in in Code of ethics is a fertile ground for doctors to use political influence and other power for escaping liability, risking politically neutral and genuine doctors who are under the target of so called medical mafia.

Negligent reporting by pathology labs in case of diagnostic tests is regulated under Section 238 of the *Muluki* Criminal Code, 2074 B.S. which criminalizes issuing false or wrong or altered laboratory's pathological test reports related to human blood, urine, spit and so on as an offence punishable with up to 3 years imprisonment and up to fine of Rs 30,000/- If on the basis of such report, any person dies or suffers grievous hurt as a result of: (a) consumption of drugs prescribed based on such report, or (b) surgery committed based on such report, or (c) treatment performed based on such report; the report giver is liable for murder or grievous hurt respectively as well as obliged to compensate victim (or heir if death) for loss.

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[34] It simply states in Code No. 9 that "According to the seriousness of the violation of Code of Medical Ethics, medical practitioners shall receive punishment ranging from a notice of attention, warning, probation (not to be allowed to work independently/should work under supervision), suspension and/or permanent removal from Council's registration.

[35] It simply states in Code No. 12 that "Nepal Medical Council holds right to erase the name of medical practitioners depending upon the gravity and frequency of the violation of code of ethics or medical negligence...". The similar ambiguity and loophole existed in previous Code- NMC Code of Ethics for doctors, 2002 as well.

It is necessary to inject the sense of justice in the minds of experts that the small holes and errors made by them during investigation and providing opinion may lead to gross injustice. Here is one critical issue to be confirmed and alert. Any expert if found intentionally giving false or misleading opinion to the court must be taken serious action by the concerned accountable institution. For example, if a doctor is by due process of law proved to have given false opinion to the court intentionally then the Medical Council Nepal has to take immediate action against such so-called expert such as disqualifying the expert from medical profession throughout the life. Thus, only those who can remain highly ethical can be experts and not simply by holding academic degrees or under blessings of power centre.

A classical example[36] of medical negligence in regard to post mortem examination is worth mentioning. A section of the post mortem report of a beheaded body prepared a few years back by a doctor of a hospital in a Terai district of Janakpur zone read like this:

Condition of eyes - open
Condition of pupils - dilated
Condition of mouth - open

Condition of tongue - not protruded and bitten by teeth and saliva dribbling from the angle of the mouth.

The doctor had performed the ritual of filling the format of post mortem report without bothering to have even a look at the dead body which was without head. Such an attitude needs to be condemned ought-right as an instance of culpable professional irresponsibility. Similarly, this case[37] is also an example of expert's gross malpractice (intentional, by mistake or by negligence) which is to be condemned by court and Nepal Medical Council.

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[36] Hari Bansh Tripathi, '*Forensic Science and Admissibility of Scientific Evidence: Practice and Expectations*' (1998) p.7

[37] *Bijaya Lodh etal.* V. *H.M.G.* N.K.P. 2040 B.S.; p. 739.

Another case example[38] of false certification by doctor that was held medical negligence by District Compensation Committee (DCC) is worth discussing. In this case, plaintiff (P) went to Israel after she was certified medically healthy and fit for foreign employment by defendant doctor (D1) in Nepal International Clinic Pvt. Ltd (D2). She was re-examined medically in Israel where P was declared unfit for work because of asthma and had to return Nepal. DCC later awarded Rs 6 Lakhs (3 lakhs from D1 and 3 lakhs from D2) as compensation for negligence due to error in diagnosis. However, from appeal, the case file was forwarded back to re-decide by quashing the decision[39]. The court pointed- in a small country like Nepal and even smaller medical professionals' community, the likelihood of not giving fair expert opinion to jeopardize the another doctor remains higher and it becomes duty of justice providers to see two aspects while making decision: a) warn experts about the personal liability for giving wrong opinion, and b) evaluate the medical standards, protocols and Guidelines to determine if there was negligence in treatment or not.

As the report of a Forensic Scientist may affect the life, liberty or reputation of a citizen, he must conduct the laboratory examination as minutely, thoroughly and objectively as possible so as to be certain that the finding will ascertain the truth, irrespective of the fact whether it favors the prosecution or the defense. As Justice Humphrey has said, an expert must always remember that he is not a witness of the prosecution nor for the defense but essentially of the court.

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[38] *Kiran Basnet* v. *Dr. Buddha Basnet*; DCC Kathmandu; DD: 2009/05/28.

[39] The decision of DCC was quashed on following grounds: (a) Violation of the principle of "one cannot be judge in one's own case" because one of the complainants had filed the case to DCC on behalf of DCC and Decision of DCC was made in the presence and involvement of a member of DCC. (b) On which factual basis and evidential basis had DCC made such decision is not reflected in its decision and hence a reasoned decision is required.

9. Types of Death for Medico-Legal Autopsy

Medical science has classified death into different types. It can be classified on the basis of nature or manner of death and the process of death of different organs of body. Medical practitioner has trend to classify death [40] as somatic and molecular for the pure purpose of medical science.

a. **Somatic death:** Permanent cessation of three primary functions of body i.e. respiration, pulsation and sensation in known as somatic death. Somatic death leads stoppage of blood circulation system inside the body. This type of death is also known as clinical or systemic death. Somatic Death refers to the death of the tissue, system or body and is clinical death, as a whole. It coincides with the death of the brainstem. Diagnosis of Somatic Death involves: 1. Permanent and complete cessation of function of brain--flat E.E.G 2. Permanent and complete cessation of function of heart---flat E.C.G 3. Permanent and complete cessation of function of the lungs---negative Winslow Test, Mirror Test, Feather Test etc.

b. **Molecular death:** The somatic death of a person leads to molecular death. Human body is an integral part of different organs formed through tissues and cells. Stoppage of oxygen supply leads absence of oxygen to these cells and death starts from cellular level. Therefore, death of individual cell is known as molecular death. In absence of oxygen supply to body, cells begin to die and the timing for cell death is different in accordance to the location of cells in body parts. For instance, cells present in brain of the person die first, after stoppage of oxygen supply to them. Molecular Death is the death of all individual cells within the body. It follows 2-3 hrs after somatic death. Diagnosis of Molecular Death 1. Muscle does not respond to strong stimuli. 2. Pupil does not respond to stimuli and drug. 3. It is associated with early and late sign of death. Medico-Legal Aspect of Stages of Death From legal aspect 1. A person is dead when somatic death has occurred hence a death certificate can be issued for the disposal of the body. 2. The organs for transplantation must be removed from the deceased before the onset of molecular death (Supravita period): Liver-within 15 mins, kidney-within 45 mins, heart-within 1 hr, and cornea-within 3 hrs.

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[40] Dr. Ranjeeta Singh Deo and Prafulla; Death and Its Medico-Legal Aspects, wjpmr, 2018,4(4), 127 -131 (https://www.wjpmr.com/download/article/33032018/1522479038.pdf)

Besides this pure medical classification, death could be classified in accordance with the manner of death. Natural death is more common and do not generate any criminal suspicion. Major cause of unnatural death occurs due to asphyxia. Hanging, drowning, poisoning, severe blood hemorrhage, strangulation, injury, electrocution etc. are other causes or manners of death. Minute and detail discussion over these modes of death have been made in Chapter 14 regarding Asphyxia.

Highlighting importance of autopsy, and differentiating dead body examination inventory (*laas prakirti muchulka*) with autopsy, Supreme Court in *Ashwin Kumar Sthapit* case,[41] laid- "Numerous injuries and scars that cannot normally be visible through ordinary external observation, can be detected through autopsy. This is because, autopsy involves minute expert examination of all external and internal parts of corpse as a special study and research based examination, capable of discovering all ante-mortem and post-mortem signs. Simply because minute findings detected by autopsy were not identified during dead body examination inventory, does not mean these two evidences contradict with each other." *Laas prakirti muchulka* involves only the picturization of normal external observation by non experts.

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[41] *GoN v. Ashwin Kumar Sthapit*; Homicide, NKP 2066, V 2, FB, D.N. 8069.

Where there is absence of direct eyewitness in any criminal offence, autopsy findings are strong and reliable evidences, if corroborated with other circumstantial evidence. This way, autopsy in crimes of suspicious death, is important to prevent impunity.

10.Legal Provisions & Procedure for Autopsy Examination in Nepal

According to Dr. A. Jay Chapman, autopsy is not simply the removal and dissection of the organs of the body but it also includes all the additional testings and studies that may be necessary to reach a final conclusion concerning the death. This view indicates, dissection of body is just a party of autopsy. The autopsy examiner should conduct additional testings of body tissues or viscera in order to find out the clear results. Mere dissection of organs is not an essential aim of autopsy. Thus, an experienced autopsy practitioner may provide valuable direction to lead the test for finding exact cause of crime. However, some specific guidelines could be appropriate to any forensic medicine practitioner to focus attention on specific area and examination of which could provide cause of death.

Autopsy of entire body and organs is very lengthy. A minor mistake or negligence during post mortem examination by autopsy practitioner could lead to loss of vital evidence related to death or alleged offence. Different body organs may have vital evidence depending upon the nature of offence or death. This means, which particular organ to focus attention for discovering substantial evidence differs from one case to another. For instance, in hanging, examination of neck is more important than other body parts. Accordingly, examination of viscera is more important in case of poisoning. This rule of autopsy enables examiner to stay focused on examining presence or absence of relevant evidential clue and minutely observe important body organs.

In *Devi Prasad Adhikari* case,[42] Supreme Court of Nepal held- once an individual comes with First Information Report (FIR), it is the duty of Police Office to register the FIR, collect evidences, prepare inventory *(muchulka)*, send the dead body for autopsy examination, and to do all necessary duties required for investigation.

Muluki Criminal Procedure Code, 2074 B.S. in section 20 duty bounds investigating authority to send corpse for autopsy to a government medical doctor or to an expert designated in that behalf by the Government of Nepal or a licensed medical doctor, at government expenses. What matters are to be investigated during autopsy are legally stipulated in format of Autopsy Report provided in Schedule-15 of *Muluki* Criminal Procedure Code, 2074 B.S. If autopsy could not be possible due to decay, investigator has to execute a deed stating out that matter in the presence of local distinguished persons. But, if, in spite of corpse being decayed, there is possibility to find cause of death by any other scientific examination, it is to be performed. Post mortem could also be conducted by a team of experts in order to find out cause of death. Previously, laws before the Code had neither the provision for such scientific examination in case of decayed corpse nor law was clear about whether even team of experts could be involved in such examination.

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[42] *Devi Prasad Adhikari v. District Police Office Jhapa et.al.* 2071 D.N. 9216)

It is a general rule that an autopsy must be done by a medical doctor or a well experienced and trained person authorized to do. A doctor should not delegate authority or allow conducting autopsy to assistants, nurses, medical interns or practicing students.

Rules regarding Autopsy

The rules and procedures regarding autopsy examination are intended to avoid any possibility of loss of vital evidence relating to the death due to numerous factors including mistake or poor skill of examiner. The autopsy must be complete and thorough. All body cavities should be opened because evidence may be found in more than one organ. A complete autopsy is necessary to substantiate the truth of eyewitness. A poor autopsy is more dangerous than no autopsy at all because it is likely to cause injustice. Besides, the rules of legal autopsy could be seen as follows:

a) The autopsy should be conducted in a mortuary (department of hospital where dead bodies are kept) and never in a private room as far as possible.

b) The medical officer should first read the inquest report (case history prepared by police) carefully and carry out the examination so that attention can easily be focused on significant issues of exploration such as- hanging, drowning, medical negligence, toxicology, microbiology, virology, radiology etc. Lack of such information may result in loss or underestimation or unrecording of vital evidence.

c) The examination should be conducted in day light as far as possible, because colour changes, such as jaundice, changes in bruises, changes in post mortem staining etc. cannot be appreciated in artificial light.

d) Name of those who identify the body must be recorded. In unidentified bodies, the marks of identification, photographs and fingerprints should be taken.

e) No unauthorized person should be present during autopsy except the investigating police officer.

f) As the autopsy is conducted, details of examination should be noted verbatim (exactly as spoken or written) by assistant.

g) If it is required to collect and preserve any tissue, part of body organs or viscera of the deceased for additional investigation or examination, such should be collected and mentioned properly.

h) Even if the body is decomposed, autopsy should be performed as certain important lesions (wounds or harmful changes in tissue or body organs caused by injury or disease) or evidences may still be found. Even if on superficial observation it is presumed that no significant evidences can be obtained from autopsy because of corpse being decomposed, autopsy has to be conducted in a manner same as normal corpse. In course of autopsy after 6 days of death in an extremely decomposed dead body who died of hanging, Modi had identified ligature mark around neck.[43] In an alleged homicide case where corpse was decomposed at the time of autopsy performed after 3 days of death, doctor detected fracture of mandible (jaw) and ribs. Udisha State High Court in India stated- decomposition of corpse affects soft body tissues but this does not affect fractures committed in bones.[44]

Where body skeleton diffuses and falls down after extreme decomposition, it is very important for prosecutor to forward such bones to anatomy expert. Failure to do so creates serious lacuna in prosecution charge.[45]

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[43] Franklin, C.A. (1997) Modi's Medical Jurisprudence and Toxicology, 28th Edn. N.M. Tripathi Pvt. Ltd. P. 84.

[44] Ahmad, Ezaj (1996), Medical Evidence and Gist on Nonmedical Evidence P. 118.

j) The doctor after completing all formalities and filling up of the the report must send it back to the police station within 24 hours, excluding travel time. According to Modi, autopsy report must be forwarded by examining doctor to investigating authority as early as possible and this time should not extend beyond 2 days.[46]

k) Forensic pathologist Dr. Stephen J. Cina says that autopsies are best if performed within 24 hours of death, before organs deteriorate, and ideally before embalming, which can interfere with toxicology and blood cultures. But autopsies performed on decomposed or even exhumed bodies can still provide vital new information, depending on the extent of decomposition. Autopsies usually take two to four hours to perform. Preliminary results can be released within 24 hours, but the full results of an autopsy may take up to six weeks to prepare.[47]

l) The detail guidelines and procedures provided in Schedule 15 of the *Muluki* Criminal Procedure Code, 2074 B.S. is to be complied strictly while conducting autopsy by an expert.

11. External & Internal Examination of Dead Body

Autopsy examination is the final service that a medical practitioner can render to a patient. Purpose of it is not just to establish medical diagnosis but also to provide facts in the service of judicial process and the public interest. Law has attempted to guide a medical practitioner in autopsy by providing the list of examination that needs to be performed in order to help establish cause of death, manner of death, time of death, and connect the victim with criminal.

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[45] Ibid

[46] Supranote 44 at 82.

[47] https://www.pbs.org/wgbh/pages/frontline/post-mortem/things-to-know/autopsy-101.html (Retrived: September 17, 2020)328

The law provides chain of custody should be maintained in entire procedure of autopsy such as from the time of sending the corpse to the hospital to return of corpse either to family members or police office. Law requires both external and internal examination of corpse during autopsy.[48]

1) External examination

External examination is carried out upon discovery of a corpse. It is also known as general observation of the dead body. In this examination, the body should be checked for visible signs of injury and those injuries that are most likely to have caused afterwards. The skin and surface of the body is examined for any irregular signs, scars or lesions and these are noted. As per Nepalese law, following things have to be examined and recorded minutely under external examination:[49]

a. Height

b. Weight

c. Physique

d. Hairs

e. Clothes and conditions

f. Post mortem changes presenti.

    i. Rigor mortis

    ii. Livor mortis

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[48] Schedule 15 of Muluki Criminal Procedure Code, 2074 B.S.

[49] Ibid

iii. Algor mortis /cooling

iv. Different signs of decomposition

g. Natural orifices (condition of eyes, mouth, vagina / penis, nose, ears, anus and urethra)

h. Injuries along with their name, size and site (Ante mortem/ post mortem/old/fresh).

2) Internal examination

Internal examination is the description of each organ system inside the body. All body cavities should be opened and examined in internal examination of corpse. Viscera may be stored especially for toxicology examination. In Nepal, the schedule provides following things are to be examined under internal examination:[50]

1. Head and neck:Scalp, skull
    - Brain and vessels
    - Orbital, nasal and aural cavities
    - Mouth, tongue
    - Neck (larynx, thyroid, and other neck structures)
    - Other relevant details
2. Chest (Thorax)
    - Ribs and chest wall
    - Diaphragm
    - Oesophagus
    - Trachea and bronchi
    - Pleural cavities

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[50] Id

- Lungs
- Heart and pericardial sac (any content pericardial sac, condition of three coronary arteries, valves and chambers and myocardium must be observed)

3. Abdomen
   - Peritoneal and pelvic cavity
   - Stomach and content
   - Small intestine
   - Large intestine
   - Liver, gall bladder, pancreas
   - Spleen
   - Kidney, renal pelvis
   - Genital organs
   - Urinary bladder and urethra
4. Spinal column
5. Specimen collected for Analysis (Mention preservative also)
6. ToxicologyStomach with contents
   - Part of liver
   - Kidney
   - Blood
   - Others, if any

Besides external and internal examination, the format requires conducting 'Special Examination'. It deals with-procedures like neck dissection, pelvis dissection, floating test of lungs etc. must be done in relevant cases and findings should be documented. Likewise, what items were handed to whom and when need to be recorded in case of: (a) Autopsy report, (b) Viscera and other samples, (c) clothes and other articles. Opinion on Cause of death, both in Nepali and English is to be mentioned. Opinion on time since death is to be mentioned. Opinion on probable type of objects or weapon causing injuries is to be mentioned. Opinion on live birth or still birth is to be provided. Other opinion, if any is also to be mentioned. Signature of three medical experts along with their Special Qualification, training & experience; date; name; NMC Reg. No.; and hospital seal are to be mentioned and affixed in the report. Autopsy is to be conducted by expert of forensic subject as far as possible or by trained physician. Report has to be prepared by examining expert or physician. The report is to be prepared in computer typed format as far as possible or in clearly understandable manner.

Language used in Autopsy report must be clear. Doctor while giving opinion regarding death, must mention specific reasons. Many doctors commit error or mistake by using adjectives such as- 'probably'. Use of words like 'probably' in report and opinion create confusion instead of helping judge to reach to a definite conclusion. It leaves mind of judges wondering and guessing different situations. Judge will have confusion regarding cause of death. Use of terms like- 'probably', 'imagination', 'possibly' etc. raises objection over the reliability and credibility of expert report. Courts have been directing experts strongly to avoid using such language in reports. Training to inexperienced forensic experts helps control this error.

12.Medico Legal Importance of External and Internal Examination of Dead Body

In absence of autopsy, the exact cause of death becomes only speculative (i.e. based only upon the testimony of eyewitness and not other evidences) or subjective and less reliable whereas autopsy examination gives objective evidence. The corpse is a silent witness who never lies.

Importance of autopsy has been expressed by Supreme Court in *Mankumari Nepali* case[51] where it laid- "The greatest evidence in homicide offence is dead body itself because its autopsy helps to identify ante-mortem injuries and post-mortem injuries and conclude about cause of death scientifically. In absence of dead body, court cannot convict defendant simply on the basis of assumption or hearsay evidence. Dead body may not be available in cases like thrown into flowing river or burnt down to ashes. Even in such cases, it is the onus of prosecutor to establish death by proof of evidence. Release of 9 offenders is tolerable but the purpose of justice gets defeated if even a single innocent gets convicted. Investigator and prosecutor should know that mere confession unsupported by independent evidence caries no evidential value. If court convicts defendant for homicide simply on the basis of FIR and allegation just because someone disappeared, but the person returns later, overall justice will get contaminated (*kalankit*)."

Where no autopsy is conducted, court has no option but only to rely on dead body inventory (*laas jaach muchulka*) which is risky for justice. Supreme court full bench in *Maniraj Limbu* case,[52] acquitted defendant from the charge of homicide because no autopsy was committed and the details of dead body inventory was considered as suspicious and uncorroborated. Court pointed- 'A summer season corpse was extremely decomposed with insect attack and hence it was impossible to identify bruises and injuries on corpse. Indeed, injuries on eyes and cheeks were detected during inventory but these sites were already attacked by insects. Defendant had testified that victim died of bear attack in jungle. Court had to summon witnesses who affixed signature during execution of inventory. Also red stain in cloth (*labeda surwal*) of defendant was not corroborated by forensic blood test and hence confession of defendant at police remained uncorroborated by independent evidence for conviction.

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[51] *GoN* v. *Mankumari Nepali*; Homicide, NKP 2068, V 12, DB, D.N. 8726332
[52] *Maniraj Limbu* v. *HMG*, NKP 2038 V 12 FB DN 1521 P. 1

Duly conducted autopsy helps to distinguish antimortem or postmortem ligature injury. Regarding the procedure to be complied during autopsy while internal examination of neck, Supreme court in *Diwash Dhakal* case[53] has rightly pointed- the major precondition and mandatory procedure for internal examination of neck is dissection of chest to reveal all organs and exposition of brain after dissection of head. The purpose of this sort of examination procedure is to ascertain whether injury caused to internal soft tissue of neck, neck bone or cartilage is antimortem or postmortem in nature.

Supreme Court in *Min Bahadur Darji* case[54] held "Dead body examination by an expert and expert opinion provided thereupon carries evidential weightage. Presence of *mens rea* is not to be ascertained under assumption, suspicion, and possibility; but has to be seen clearly by evidences, and to show it is the onus of plaintiff."

13.Estimation of Time of Death

Time of death is estimated during autopsy by observing post mortem changes in dead body. It helps in reasonable fixation of exact time of death through examination of post mortem changes. Post mortem changes that occur after death can be classified as follows: (1) Algor mortis, (2) Livor mortis, (3) Rigor mortis, (4) Decomposition, (5) Adipocere, and (6) Mummification.

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[53] *Diwash Dhakal* v. *GoN*, Homicide, NKP 2075 V 12, DN 10146
[54] *GoN v. Min Bahadur Darji 2065* D.N. 7928

1) Algor Mortis (Cooling of the body)

The normal body temperature varies from 36-37.2°C. Normal rectal temperature is typically 0.27° to 0.38°C (0.5° to 0.7°F) greater than oral temperature.[55] When a person dies, his normal body temperature begins to fall down until it reaches equivalent to temperature of surrounding environment. Cessation of energy production and heat results in fall of body temperature. Temperature of surrounding environment differs with environment and ecology. It does not occur at the same time throughout the body. The body cools rapidly on the surface and slowly in the interior in about 30 minutes to one hour after the death, the rectal temperature falls little or not at all.

The cooling rate is relatively uniform as per the temperature of air. Body heat is lost by conduction, convection, radiation or evaporation. The speed of reduction of temperature depends on several factors like amount of cloth in body, nature of environment (ice/water/morning/mid-day/winter/summer). Thus, it is estimation and not determination. Rectal temperature is measured with the help of thanometer. Estimation of time of death is important to frame defense of alibi as well. The reading should be made at intervals in order to obtain the rate of fall of temperature. The rough idea of approximate time in hours of death is obtained by formula.[56] Number of hours after death = "(normal temp.) 98.4°F - rectal temp. at time of examination"; divided by "the generalised rate of temp. fall per hour."

Features affecting rate of cooling:

- Difference in temperature between body and medium.

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[55] https://www.ncbi.nlm.nih.gov/books/NBK331/334

[56] G. S. W. De Saram, G. Webster, N. Kathirgamatamby; Post-Mortem Temperature and the Time of Death, Journal of Criminal Law and Criminology,V46, I 4, No.12 (https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=4412 &context=jclc Retrived: Sept.16, 2020)

- Fat is bad conductor of heat. Fat body cools slowly and lean body cools rapidly.
- Body kept in well-ventilated room cools rapidly than one kept in closed room.
- Body buried in earth cools rapidly than those in air, but cools more slowly than those in water.
- Clothed body, as clothes are bad conductor of heat, cools slowly than nude dead body.
- The rectal temperature of an average sized naked body reaches that of environment in 20 hours. If the body is exposed to a source of heat for a few hours shortly after death, its temperature will rise.
- A body in zero weather may undergo freeze and become stony hard due to formation of ice in cavities and blood vessels. The ice inside skull may expand and cause separation of sutures.

2) Livor Mortis (Post Mortem Lividity)

Post mortem lividity refers to the process of collection and fixation of blood at the lower side of body. After death, a person's blood circulation stops and is coagulated (settled) in lower part of body due to gravity of earth. It is caused by stoppage of circulation and the stagnation of blood in blood vessels and its tendency to sink by force of gravity. Sink of blood from these vessels produce a bluish purple color to the adjacent skin. The blood of upper portion of body drains and becomes pale. Post mortem lividity begins shortly after death, but it may not be visible till for about half to one hour in normal individual, and for one to four hours for anaemic person. It is usually well developed within four hours and reaches a maximum between six to twelve hours. It is present in all bodies but is more clearly seen in bodies of fair skinny people than in those of dark. Distribution of clot depends on the position of the body. In a body lying on back, it first appears in the neck and spreads over the entire back except for the parts directly pressed on. When coagulation or accumulation in capillaries takes place, the stains become permanent and this is known as fixation of post mortem stains.

Livor mortis starts to form after 1 hour of death and is completed within 5-6 hours. Then, hard blood clot is formed within next 5-6 hours and thus, after this time, the position of livor mortis remains permanent and unchanged even if dead body's position is moved elsewhere. The colour of post mortem lividity is purple (bluish/reddish) and more clearly visible in white skin body.

The hypostatic areas have distinct color in certain cases of poisoning: [57] (a) Cherry-red in case of carbon monoxide poisoning, (b) Bright red in case of hydrocyanic acid poisoning and sometimes in burn, (c) Red brown or brown in case of poisoning by Nitrites, potassium chlorate, potassium bicarbonate, Nitrobenzene and aniline, and (d) Dark brown in case of poisoning by phosphorus.

There are some factors influencing the formation of post mortem lividity. They are as follows:

a) Post mortem lividity requires fixed, undisturbed position of dead body for some hours after death. With frequent changes in the position of body, coagulation could not be formed or its volume may be distributed.

b) In case of serious laceration, blood hemorrhage due to incised wound or injury, body lacks blood due to drain out. It may impair the process of formation of post mortem staining.

001-bleeding-corpse.

c) It may not be prominently seen in deceased having dark skin colour.

d) It would be found in well formed condition in case of death due to asphyxia.

e) Generally, staining is well formed on front and side of the neck.

Medico Legal Importance

1. It is a clear sign of death.
2. The extent of coagulation helps in estimating the time of death. Formation of staining, size, its extension and fixation conveys time since death.
3. It indicates the posture of body at the time of death.
4. It may indicate moving of body to another position, sometimes after death.
5. The colour of bloodstain may indicate the cause of death in case of poisoning.

3) Rigor Mortis (stiffening of dead body)

It is a state of stiffening or hardening of body muscles with slight shortening of the fibers after death. Voluntary muscles consist of long fibers made up of two proteins i.e. Actin and Myosin. During life, the separation of actin and myosin filaments and the energy needed for contract depend on Adinosine Triphosphate (ATP), which is responsible for elasticity and plasticity (alteration) of the muscles. After death, the ATP is progressively and irreversibly destroyed forming Lactic Acids. When Lactic Acids concentration reaches a level of 0.3%, muscles go into an irreversible state of hardness known as rigor mortis.[58]

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[58] Apurba Nandy, Principles of Forensic Medicine Including Toxicology, 256.

At first, it appears in involuntary muscles, the myocardium (heart) becomes rigid in one hour of death. It begins in the eyelids, lower jaw and neck, and passes upward to the muscles of the face and downwards to the muscles of the chest, upper limbs, abdomen, lower limbs and lastly to the finger and toes.

Rigor mortis is a physio-chemical process, which after development, the whole body is stiffened and the whole body becomes shorter and harder. Post mortem emission of semen may occur agonally (in extreme pain) or later due to rigor mortis in the dartus (muscles in the scrotum). Fetus may get expelled in pregnant woman's death due to contraction of uterus muscles followed by rigor mortis.

In hot areas, usually rigor mortis lasts 24-48 hours in winter and 18 to 36 hours in summer, it lasts for 2-3 days in temperate regions. These times are variable because of many extrinsic and intrinsic factors such as age, nature of death, muscular state, atmospheric conditions etc.

Stiffening of a body occurs due to contraction of Actin and Myosin muscles i.e. due to formation of ATP (Adenosine Tri Phosphate). Rigor mortis starts from jaws and then gradually shifts to neck to thorax (chest) to abdomen to legs.

The rigor mortis shows some features. They are as follows:

a) Rigor mortis constricts heart muscles at first. The heart muscles become rigid and heart chambers become empty.

b) Pupils are constricted.

c) Post mortem ejaculation of seminal fluid in male would occur.

d) Rarely, if the uterus is in labour at the time of death, the rigor mortis may cause the uterus to contract and expel the fetus.

e) Rigor mortis is not formed in a child who is below 7 months.

f) It develops fast in thin person than fat person.

CS CamScanner

Medico Legal Importance

6. It is a sign of death.
7. Its extent helps in estimating the time of death.
8. It indicates the position of body at the time of death.

Difference between Rigor Mortis and Cadaveric Spasm

Cadaveric spasm is also known as instantaneous rigor or instantaneous rigidity. Generally, it refers the condition of cadaver in which the muscles of body remain in continued condition of contraction, which occur suddenly and just immediately before death. The position of the body before the death will not be changed and the body does not pass through general relaxation process. Muscles are in position of contraction of cadaveric spasm in which one group of muscles in body involve. This sort of hardness due to contraction of body prevents its normal relaxation and often it makes confusion with rigor mortis.

This occurs in cases where death has occurred at the time when the body was in great muscular exertion and mental excitement. It is common in situations such as that in the battle field, drowning, strangulation, suicide, etc. The exact reason of cadaveric spasm is not known but excess neuronal discharge into particular group of muscles before death is cited as one of the reasons. Medico-legally, cadaveric spasm has great values as presence of weapon, hair, weeds, pieces of clothes, etc. found grasped in hands may indicate towards the cause of death. Cadaveric spasm is an ante-mortem phenomenon and cannot be created after death. Weapon held in a hand where cadaveric spasm is present can be removed only with great difficulty.[59]

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[59] https://www.moscmm.org/pdf/%5bRK_Sharma%5d_Concise_Textbook_of_Forensic_Medicine.pdf

Cadaveric spasm could reflect the torture or extreme suffered by the deceased before victim. It is an ante-mortem phenomenon that begins at the time of death and continues after death. Presence of cadaveric spasm helps to figure out the last act done by the deceased, cause of death and manner of death. For instance a body recovered from lake could grip some grass, flora, mud etc in clinched palm. This fact helps to deduce that the deceased was alive before being thrown into or before jumping in the lake and had struggled to save his life. It is a clear sign of death caused by drowning.

Differences in between rigor mortis and cadaveric spasm are as follows:

Basis	Rigor Mortis	Cadaveric Spasm
Beginning	Starts from few hours of death	Instantaneous with death (ante mortem)
Involvement of muscles	Both Voluntary and involuntary Muscle. Heart is the first to be involved. Small muscle of digits develop it last	Local Voluntary Muscle eg. Hand with knife in suicide
Area	Spread all over the body	Present only to the contracted muscles
Duration of presence	12-18 hours in summer and 1-2 days in winter	Until replaced by rigor mortis, in some cases continually present with rigor mortis
Predisposing factor	Nil	Excitement, fear etc along with contraction of muscles during death
Body temperature	Low	Comparatively high (because it could be noticed in the stage of Algor Mortis)

Degree of stiffness	Moderate. Moderate force required to break it	High. Great force required to break it.
Mechanism of formation	Known. Breakdown of ATP muscle	Still Obscure
Medico legal importance	Mostly sign of death and helps to estimate time of death	Mostly helps to enumerate cause of death and manner of death.

4) Decomposition/Putrefaction

It is the final stage following death. Decomposition is caused by saprophytic micro-organism such as bacterial enzymes, mostly anaerobic (not using oxygen) organisms derived from the bowel (two intestines), and fungi, such as penicillium and aspergillus and sometimes from insects, mature or in larval stage. They cause marked haemolysis, liquefaction of post mortem clots and of thrombi, disintegration of tissue and gas formation in blood vessels and tissue spaces. Bacteria produce a large variety of enzymes and these breakdown the various tissues of the body.

It begins immediately after death at the cellular level, which is not evident grossly. There is progressive softening of soft tissues and the alterations of their proteins, carbohydrates and fats. Organisms enter the tissue shortly after death, mainly from the alimentary (food) canal, and less often through respiratory tract or through an external skin wound. Fall in the oxygen concentration in the tissue and rise in hydrogen ion after death favor bacterial growth and spread throughout the body. The characteristics of putrefaction are:-

- Changes in the colour of tissues: At early stage of putrefaction, hemoglobin diffuses through the vessels and stains become red and reddish-brown color. Various derivatives of hemoglobin form in tissues and the colour of tissues gradually changes to greenish black then greenish discolouration of skin. The colour appears 12 to 18 hours in summer and in 1-2 days in winter. Green colouration is more clearly seen on a fair skin than on a dark one.

- Evolution of gases in the tissue: The complicated structure proteins and carbohydrates split into simpler composition of amino acid, ammonia, carbon monoxide, carbon dioxide, hydrogen sulphate, propagated hydrogen methane and mercaptans. Gases collect in the intestine in 6 to 12 hours in summer and the abdomen becomes tense and distended. Swelling due to gases is most marked in the face, genitalia and abdomen.
- Liquefaction of tissues: Liquefaction of tissues begins from 5 to 10 days or more after death. The tissues become soft, loose and are converted into the thick, semi-fluid, black mass and are separated from the bones and fall off.

Decomposition is a process of breaking down of complex particles into simple. In other words, when a dead body is subjected to wear and tear, decomposition starts when rigor mortis ends. Various micro organisms are responsible for decomposition. Decomposition leads discolouration of body and swelling of body. Emission of foul smelling gas gradually indicates process of the destruction of whole body.

Decomposition starts from abdomen. In summer, it starts within 8-24 hours after rigor mortis. Similarly, 1-3 days is estimated in winter environment. Decomposition spreads gradually to all over the body. Then within 24-30 hours of initiation of decomposition foul smelling gas accumulates in abdomen. Within 30-48 hours abdomen gets swollen, breasts in female and penis in male gets swollen. Within 48 to 72 hours face gets completely swollen, person cannot be identified and hair and nails become loose. Within 3 to 5 days abdomen bursts, foul smelling gas comes out, teeth becomes loose.

5) Adipocere Formation

It is modification of putrefaction where fatty tissues of the body change into a substance similar to soaps known as adipocere. The whole fat of the body is converted into palmitic, oletic, stearic and hydroxy stearic acids and a mixture of these substances form adipocere. The adipocere is inflammable and burns with a faint yellow flame, it floats in water and dissolves in alcohol and ether. In temperate countries, the shortest time for its formation is about three weeks in summer. Thus, it is a process of transformation of body fats into white waxy like, cheese like substance underneath the body.

6) Mummification

It is a modification of putrefaction in which dehydration or drying and shriveling of the cadavers occurs from the evaporation of water but the natural appearances and features of the body are preserved. The mummified tissues are dry, leathery and brown. The entire body looses weight; becomes thin, stiff and brittle. Failure in protection of mummified body will lead it into breakdown and gradually will become powdery and disintegrate. On the other hand if it is protected, could be preserved for years. The mummified body is practically odourless. The time required for a complete mummification of body varies from 3 months to a year and is influenced by size of body, atmospheric condition and the place of disposal. It is the process of drying of dead body due to loss of water. The internal organs lose weight and size.

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14. Determination of Cause & Manner of Death

Medico legal autopsy examiners determine the cause and manner of death of the deceased after complete examination of the dead body. All findings from the dead body shall be examined and tested for formation of opinion regarding to cause and manner of death. Cause and manner of death differ in accordance to types of death and types of incident suffered. Detail discussion has been made in chapter 14 regarding Asphyxia.

15. Examination of Mutilated Body

A mutilated body is a disfigured dead body by losing its identity marks that can be found in the whole body. Mutilated body exists in cases of explosion, mass destruction, complete piecing of body parts or beheaded etc. In mutilation, the investigator could find different fragmented parts of the body such as head, limbs, legs, abdomen, small piece of flesh or tissues etc. Mutilated body contains soft tissue of body such as flesh, muscles, skin or blood. Whereas, in skeleton only bones remain and no muscles are attached. Thus, mutilated body and skeleton are two different things in forensic science.

Objectives of examination of mutilated body parts and fragments:

1) To detect the source whether it is a human organ or animal: The primary objective of examination of mutilated body parts is to identify whether it is of human or animal origin. Some parts of the flesh or soft tissue are sent to forensic laboratory for precipitin test. Moreover, specific test is done by Antiglobulin Test. In addition, if medical college is near, it should be sent to department of human anatomy.

2) If primary test confirms it is human tissue or flesh, next

examination is directed to determine whether all the parts belong to same person. In mass explosion, the different parts are to be fit together by investigator. If they resemble then the investigator determines it as of same individual. For e.g. in Rajiv Gandi's Bomb Explosion case, his fragmented parts were identified also on the basis of clothes that he had worn.

3) To determine personal identification of victim such as age, sex, height etc.

4) To determine cause of death etc.

The DNA examination of all body tissue or flesh is a reliable method to identify different parts of the body of same person because DNA of a person is constant. If the nucleotide arrangement (genetic code) of DNA shows difference, it provides the information that the body parts are not of same person and informs that more than one person were mutilated.

In Nepal there is trend to avoid or skip autopsy of so called high profile dead bodies. This is a wrong trend. Autopsy is a neutral scientific examination that helps to discover real fact and truth about the manner, time and cause of death. Legal provision that requires mandatory autopsy in suspicious deaths has to be implemented equally to all. Law has to recognize right of pubic to know the truth about death of people who claim that they work for service to public. Being informed about cause of death of people living in the society that we share together is a matter of public interest and concern. This information is very significant for government to adopt needy future strategy for protection, security, and maintenance of peace and order in society. Had autopsy been allowed to be done in case of 10 peoples death of Nepal's royal massacre[60] dated 1 June, 2001; and in case of unexpected sudden death of Prakash Dahal, son of former PM

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[60] Dr Harihar Wasti Interview on Suman Sanga in Kantipur TV HD, September 19, 2019 https://www.youtube.com/watch?v=DkdxQTsJ9Mw

Pushpa Kamal Dahal dated November 2017, justice system would know the truth what exactly had happened.

Sudden and unexplained deaths and mysterious and suspicious deaths should be reported to the concerned legal authority. In such circumstances, there should be no issue of a death certificate (cause of death certificate) without a formal medicolegal death investigation by the legal authority. Deaths that appear to be non-criminal deaths at first can turn out to be criminal-deaths on further investigation.[61]

Autopsy report is helpful even in resolving civil disputes such as medical negligence remedy cases filed under tort for compensation by victim. Autopsy helps to discover whether death was due to negligence of doctor, nurse, pharmacist, hospital management or not. But, it is a shame, Nepalese law does not require negligently killed patient in hospital bed, to be forwarded for getting autopsy examination done for identifying the exact cause, manner and time of death. Till date, we are blindly relying on and trusting oral announcement of commercially established private hospitals' words regarding cause of patient's death in their bed. Who, how, when, what manner of negligence inflicted loss to patient or caused death of patient is to be confirmed through medico-legal examination and autopsy examination of the injured and dead patient respectively. But, the culture of performing autopsy examination of a patient's corpse who suspiciously died in hospital during treatment is yet to be institutionalized.

Usually the remedy for medical negligence is civil under tort against negligent health care provider, where patient suffering loss claims compensation under Consumer Protection Act, 2075 B.S. Simply because patient died in hospital or simply because treatment could not be successful is not an indicator of medical negligence so long as doctor applied reasonable care and effort towards saving life and making treatment success. Only in rare cases of maliciously intended harm or serious disregard to life of patient, negligent physician/nurse/surgeon gets prosecuted for for criminal negligence under section 231 and section 232 of *Muluki* Criminal Code, 2074 B.S.

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[61] Ritesh G. Menezes; Francis N. Monteiro; Forensic Autopsy, StatPearls Publishing LLC. (2020) {https://www.ncbi.nlm.nih.gov/books/NBK539901/ Retrived: September 13, 2020}